ON SOME AUSTRALIAN ELEOTRINÆ.

By J. Douglas Ogilby.

Up to the present time all Australian writers on ichthyology have been content to follow the author of the British Museum Catalogue of Fishes (*1859-1870*) in collecting all the various forms of the Eleotrine Gobies in a single large, heterogeneous, and unwieldy genus; under the common name *Eleotris* this is made to include a number of fishes, which, although having a general resemblance to one another in their habits and mode of life, have developed such widely diverse structural peculiarities that the impossibility of maintaining the intimate connection inaugurated in that work, and subsequently adhered to in other important papers by the same author, becomes immediately apparent to anyone to whom the opportunity of studying the fishes themselves is given.

In the paper here submitted, I have, therefore, endeavoured to separate into natural groups certain of our common south-eastern cismontane species, in the hope that the proposed genera will form a nucleus round which to gather a part at least of our Australasian forms and so facilitate the identification of the remainder.

In undertaking even this partial revision of our *Eleotrinæ*, I am, however, placed at a great disadvantage through my inability to consult Dr. Bleeker's paper on the divisions of the *Gobiidæ*, no copy of which is obtainable in Sydney, nor indeed, so far as I am aware, does one exist in any of the Australian Colonies. It is quite possible, therefore, that one or other of the four genera here proposed may be identical with one of Bleeker's, but the advantage to my fellow-workers in Australia of having a clear

and concise definition of certain forms, which are probably distributed over the length and breadth of our faunic region, must be held to outweigh in importance the risk of unnecessarily increasing the synonymy.

The only paper dealing with the divisions of the genus *Eleotris*—as accepted by Australian authors—to which I have access is the "Review of the *Gobiidæ* of North America," by Professors Jordan and Eigenmann,* and I am unable to identify any of the five species described below with the genera there characterised.

Though somewhat irrelevant to the subject matter of this paper, as set forth in its heading, a short account of the fish life to be met with in the waterholes near Sydney—everywhere favourite haunts of the fishes of this subfamily—will be both interesting and instructive, as a proof of the vast capabilities which even a small and to all appearance most unpromising puddle may possess towards elucidating some of the problems of our fresh-water fauna; and the fact of the discovery of so brilliantly coloured yet undescribed a species as *Carassiops longi*, within so short a distance of the metropolis, speaks for itself as to the possibilities dependent on a systematic examination of the waterholes and overflow ponds in the more remote parts of the Colonies, while it is a tangible demonstration of the culpable ignorance which prevails among us in regard to the many curious and interesting forms of animal life which inhabit our streams and ponds.

I shall make, therefore, no further apology for interpolating here the following account of a collecting trip made by me last April in company with Mr. J. D. Grant, Inspector of Fisheries, to the Liverpool district, and which produced results quite unexpected by me.

This visit was paid, by invitation, on the 24th of last April to the Hon. Wm. Long's estate of Chipping Norton, and was undertaken principally with the object of obtaining examples of a

* Proc. U. S. Nat. Mus. ix. 1886, p. 477; for a copy of this excellent paper I am indebted to the courtesy of the authors.

Gray Mullet, which was said to be found in the George's River above the weir at Liverpool and in the adjacent waterholes, and which, my informant assured me, differed greatly from any of those inhabiting the estuary, in which it was very rarely obtained, and then only after severe floods, by which a few of these fishes and of the fresh-water Herrings (*Potamalosa nova-hollandiæ*) are occasionally swept down over the weir from the upper reaches of the river.

The pools which we netted are merely drinking-places for stock, either of artificial construction or natural depressions of the ground, and are fed by the overflow from the river during flood-time supplemented by the rainfall, or in one instance at least by filtration through the sandy ridge intervening between the water-hole and the river, the water always maintaining the same level in the two.

At the time of my visit all the pools were very low in consequence of the long continued drought, only the one to which reference has just been made being anywhere of a greater depth than six feet, and in it, owing to the inequalities of the bottom and the presence of snags, assisted by the clearness of the water—the result of filtration—we were almost quite unsuccessful, our entire capture consisting of a single example of the Smelt (*Retropinna*) and a young Australian River-Perch (*Percalates colonorum*).

The latter of these species is known to occur abundantly along the entire coastal region of south-eastern Australia and northern Tasmania, but the range of *Retropinna* is by no means so well understood, as it has been very generally confounded with *Galaxias*; but, in such opportunities as I have enjoyed for observing our fresh-water fishes in their native haunts, I have not so far succeeded in detecting the two genera as associating in the same waters. In Macleay's Catalogue, No. 840, Vol. ii. p. 164, (*Proc. Linn. Soc. N.S. Wales, vi. 1881, p. 228*) the only Australian locality given is "Rope's Creek," and we may, therefore, take it for granted that this was the only place known to the author from which the genus had been recorded outside of New

Zealand. No less than fifteen years previously, however, Dr. Steindachner, in a paper entitled "Zur Fischfauna von Port Jackson in Australien" (*Sitzb. Ak. Wien, liii. i. 1866, p. 469*), had recorded the species; again, no further mention of the species is made in Macleay's Supplement (*1884*), though during the previous year Johnston's "Catalogue of the Fishes of Tasmania" (*Proc. Roy. Soc. Tas. 1882*) had been published, at p. 62 of which the author states that it is "found in the various estuaries of Tasmania at certain periods of the year." Personally I have caught these fishes in the stream which flows from the dam of the Parramatta water supply; in the Nepean River at Menangle; in the Prospect Reservoir, where they swarm in almost incredible numbers, and, as above mentioned, in the watershed of the George's River; it may, therefore, be inferred that *Retropinna* is an inhabitant of most of our coastal waters, though its exact northward and southward extension has yet to be determined. On the latter I am enabled, however, to throw some light, as a small example is present among some fishes forwarded to me by Mr. James A. Kershaw, and the notice accompanying the specimen runs thus—"Pyramid Hill (about 150 miles from Melbourne and north of Bendigo)"; this extension of range, though in itself an interesting addition to our meagre knowledge of the species, is much less important than the fact—of which I have reliable information—that the section of country in which Pyramid Hill stands drains into the Murray River, and that, therefore, in one district at least *Retropinna* has succeeded in crossing the Dividing Range.

It was in the deep pool that we expected to catch the Mullets for which we were especially in search, and though, for the reasons given above, we were unsuccessful on this occasion, there can be no doubt that the species is *Mugil breviceps*, Steindachner, a very handsome Mullet, remarkable for its small head and entirely confined to fresh water, which I subsequently found to be common in the upper waters of the Nepean River at Menangle;*

* A full account of this species will be given in a paper on the Australian *Mugilidæ* now in course of preparation.

at both places I was further assured that there was a second species of Mullet found in the fresh water.

The three other pools which we fished were of much smaller dimensions—the largest about twenty-five yards by ten, the smallest not a third of that size—and nowhere exceeded four feet in depth; they were, however, crowded with fishes of several kinds; indeed it is difficult to imagine whence food could have been supplied in sufficient quantity to keep so many individuals in the healthy condition in which we found them; the only aquatic animals which I found associated with them were a small shrimp (*Palæmon, sp.*) and a large and handsome water-beetle (*Homœodytes scutellaris*), and though these were brought ashore among the weeds in considerable abundance, their numbers, unless materially supplemented from outside, were quite insufficient to bring about the results which we witnessed.

In point of numbers the ubiquitous Carp (*Carassius auratus*) of course greatly exceeded all the other species together; they were of all sizes and of all tints, from a dull olive-green or brown to gold, among the latter being some of the largest and most brilliantly coloured individuals that I have ever seen. These pests swarm in most of the fresh waters of the metropolitan and neighbouring districts, usurping the place and consuming the food of better fishes; introduced from abroad like the rabbit and the sparrow, they have similarly thriven and multiplied, and, but for the nature of the element in which they live and their distaste for or inability to live in purely salt water, would doubtless have similarly spread with equally disastrous results to the native fauna; yet in the face of this and of the fact that they are useless as food, the "Fisheries Act" now before the country proposes to protect the "Carp"* and makes it penal to offer them for sale if under five ounces in weight or by analogy to destroy them.* In

* The true Carp (*Cyprinus carpio*), a species of considerable value as a food fish—and which with the Small-headed Mullet (*Mugil breviceps*), the Tench (*Tinca vulgaris*), and the Gourami (*Osphronemus olfax*) might with advantage be introduced into all Government tanks, especially in the western districts—has never been acclimatised in any part of the colonies.

place of this, it should be made punishable to introduce this pest into any waters of the colony at present free from it, and stringent regulations should be at once issued to all caretakers of Government tanks prohibiting its introduction therein.

Both species of fresh-water Eel (*Anguilla australis* and *reinhardtii*) were taken, the latter being, as is invariably the case in this district, much the larger. The Long-finned or Reinhardt's Eel is the common eel of the New South Wales rivers and estuaries, so that nine out of every ten exposed for sale in the Sydney markets belong to this species, which attains to a weight of at least fifteen pounds, whilst with us a specimen of *australis* exceeding two pounds is a rarity, though, according to Mr. Johnston (*Proc. Roy. Soc. Tas. 1882, p. 61*) that species reaches the enormous weight of thirty pounds in some parts of Tasmania. Both Macleay and Tenison Woods have confounded *reinhardtii* with *australis*, from which it may at once be distinguished by the anterior position of the origin of the dorsal fin, which commences far in advance of that of the anal instead of nearly opposite to it as in *australis*. Roughly speaking, *australis* is the southern form, being the common fresh-water Eel of Tasmania, Victoria, and South Australia, while *reinhardtii* occupies a similar position on the east coast from Sydney northwards to Cape York.

To return to the *Eleotrinæ*:—

The name "Gudgeon" is very generally accepted throughout Australia for these little fishes, having been doubtless given to them by the earlier colonists on account of a certain similarity in their mode of life as well as a fancied resemblance in their appearance to the European Gudgeon (*Gobio fluviatilis*).

Sexual and seasonal differences:—Among bony fishes distinctive characters by which the sexes may be recognised externally are not common, but, as far as the species considered in this paper are concerned, the Australian Gudgeons are an exception to this general rule, the shape and size of the genital papilla being an accurate guide to the sex; in all the Gudgeons proper (*Eleotrii* and *Butii*) of Bleeker, this organ is narrow and

triangular in the male, short, broad, and posteriorly emarginate in the female, while in the Carp-Gudgeons (? *Carassiopsi*) it is oblong in both sexes, with the hinder border emarginate, but that of the male is so much the longer that its lobes embrace the origin of the anal fin. In some species, also, there is a marked prolongation of some of the fin-rays in the male fish.

During the spawning season the cheeks in both sexes, but more especially in the males, become to a greater or less extent tumid, while the genital papilla of the female develops one or more series of small supplementary papillæ, forming a fringe.

These facts should be carefully borne in mind by anyone describing or identifying a species from a single individual.

Breeding.—I have been unable to find any account of the breeding habits of the Eleotrids, or the means employed, if any, to ensure the safety of the eggs and newly hatched young and to guard against hybridisation, but the fact that in a single small pool many pairs of these fishes, belonging to three different species, were simultaneously engaged in spawning, and that no hybrid has ever been recognised, clearly suggests that nests of some sort are formed for the reception of the eggs.* Where the nests are situated and whether the ova when deposited are watched over by the parents must be left for future investigation to decide, but there was no appearance of any such construction among the weeds drawn ashore by the net.

Appended is a synopsis of the genera proposed in this paper :—

i. Abdominal vertebræ more numerous than the caudal; sexes dissimilar in colour, similar in the shape of the genital papilla.

A. Head deeper than wide; mouth small; outer series of mandibular teeth slightly enlarged; gill-openings narrow; six branchiostegals; genital papilla large; head partially scaly ... ...

Carassiops, p. 732

* This is known to be the case with some at least of the allied marine Gobies.

ii. Abdominal vertebræ less numerous than the caudal; sexes similar in colour, dissimilar in the shape of the genital papilla.

A. Head as wide as deep; mouth small; outer series of teeth slightly enlarged; gill-openings narrow; five branchiostegals; genital papilla large; head partially scaly.

a. First dorsal with 7 rays; fourth ventral ray produced and filiform; pectoral with not more than 16 rays: scales large; cheeks and interorbital space scaly ...
KREFFTIUS, p. 736

a'. First dorsal with 6 rays; fourth ventral ray not produced; pectoral with not less than 18 rays; scales moderate; cheeks mostly, interorbital region entirely naked ... ...
MULGOA, p. 740

A'. Head wider than deep; mouth large; gill-openings wide; six branchiostegals; genital papilla small; head almost entirely naked ... ...
OPHIORRHINUS, p. 745

CARASSIOPS, gen.nov.

Eleotris, sp. auctt.

Body oblong and compressed, the back rounded; head rather small, compressed, much deeper than wide, rounded above; mouth small and oblique, the lips thin; premaxillaries protractile; maxillaries narrow, with the distal end exposed and curved downwards; lower jaw but little the longer; jaws with a band of villiform teeth, the outer mandibular series slightly enlarged in front; lower pharyngeals forming together a subtriangular patch, the outer and symphyseal series strong and hooked; nostrils widely separated, the anterior tubular; eyes lateral; none of the bones of the head armed; gill-openings narrow, extending forwards to below the angle of the preopercle, the isthmus narrower than the interorbital regions; six branchiostegals; pseudobranchiæ present, small; gill-rakers short, stout, and simple. Dorsal fins separate, with vi, i 9-10 rays, the spinous ones flexible; anal fin originating

behind the second dorsal, with i 10-11 rays; ventral fins well developed, not in contact basally, inserted behind the base of the pectorals, with i 5 rays, the fourth soft ray produced and filiform; pectoral fins moderate and pointed, with 13 or 14 rays, the middle ones the longest: caudal fin rounded, the peduncle strong. Genital papilla large, scales large and somewhat deciduous, those of the tail a little larger than those of the trunk; head partially scaly; scales of the head and anterior part of the body cycloid, the remainder ciliated. Vertebræ 25 (14 + 11).

Etymology.—*Carassius*, a Carp; ὤψ, resemblance.

Type.—*Eleotris compressus*, Krefft.

Distribution.—Coastal regions of Eastern Australia.

CARASSIOPS LONGI, sp.nov.

Long's Carp-Gudgeon.

D. vi, i 9. A. i 10. P. 13-14. Sc. 27-29/8. Vert. 14/11.

Body moderate, the tail not conspicuously compressed. Length of head $3\frac{7}{10}$ to $3\frac{9}{10}$, depth of body $3\frac{3}{5}$ to 4 in the total length; depth of head $1\frac{1}{3}$ to $1\frac{4}{11}$, width of head $1\frac{7}{10}$ to 2, of the slightly convex interorbital region $3\frac{3}{4}$ to $4\frac{1}{5}$,* diameter of eye $3\frac{2}{5}$ to $4\frac{1}{4}$ in the length of the head; snout much broader than long, very obtusely rounded in front, not depressed, as long as to as much as one-fourth of a diameter longer than the eye. Maxillary not reaching to the vertical from the anterior margin of the eye, its length $3\frac{1}{5}$ to $3\frac{4}{5}$ in that of the head. Ten gill-rakers on the lower branch of the anterior arch, all of them simple and tooth-like. The space between the origin of the first dorsal fin and the extremity of the snout is as long as or a little less than its distance from the base of the last soft ray; the fourth spine is the longest, $1\frac{1}{2}$ to $1\frac{3}{5}$ in the length of the head and reaching when laid back beyond the origin of the second dorsal fin in the ♂, $1\frac{1}{5}$ to 2 in the head and not reaching as far as the second dorsal in the ♀; in the ♂ the seventh soft ray is the longest, as long as the head, in

* $4\frac{4}{5}$ in one specimen.

the ♀ the second and third are the longest, $1\frac{1}{3}$ to $1\frac{1}{2}$ in the head: the anal fin originates a little behind the second dorsal and is in all respects similar to it: fourth ventral ray considerably longer than the third or fifth, longer than the head and extending well beyond the vent in the ♂, shorter than the head and reaching to or not quite to the vent in the ♀: pectorals rounded, the middle rays the longest, as long as or a little shorter than the first ventral ray, reaching to or beyond the vertical from the origin of the second dorsal in the ♂, to beneath the dorsal interspace in the ♀: caudal fin large and rounded, as long as or a little longer than the head; caudal peduncle shorter and deeper in the male than in the female, as long as or a little shorter than the head; its depth $1\frac{3}{5}$ to $1\frac{2}{5}$ in the ♂, $1\frac{9}{10}$ to $2\frac{1}{10}$ in the ♀ in its length. Genital papilla large and oblong, notched at the extremity, which is simple and passes along either side of the origin of the anal in the ♂, double, papillose, and does not extend as far as the anal fin in the ♀. All the scales imbricate, those of the head (except the opercle), throat, and anterior part of the body smaller than the others.

♂. Greenish-yellow, with the edges of the scales olive, the head, nape, and belly orange; a purple spot on the opercle and another in the axil of the pectoral present or absent; dorsal and anal fins orange, with a wide purple marginal band, the soft dorsal posteriorly with white spots, the extremities of the anal rays white; caudal fin yellowish-gray with irregularly anastomosing series of microscopic spots; pectorals and ventrals gray.

♀. Yellowish-green, the upper scales with or without a basal violet spot, which, when present, gradually disappears on the sides; below grayish-white; upper surface of head golden, the opercles gray, both more or less clouded with violet; sometimes with a golden band on the sides of the abdomen; dorsal fins bright yellow, with a wide marginal violet band, the anterior with some scattered dots, the posterior with clouded spots formed by irregular groups of similar dots; anal fin gray washed with yellow posteriorly and widely margined with pale violet; sometimes a dusky axillary spot.

This handsome species can be at once distinguished from *compressus*, of which it is the southern representative, by its more elongate body, that of *compressus*, the type of which I have compared with my specimens, having a depth of $3\frac{1}{3}$ in the length, while the depth of the head is almost equal to its length; the same measurements are maintained in two examples from the Tweed River in the Macleay collection.

In 1867 Dr. Franz Steindachner described a species of *Carassiops* from Cape York, for which he proposed the name of *Eleotris brevirostris*,* and this northern form appears to approach more closely to the Sydney species than to Krefft's; in fact at a later page (325) of the same volume Steindachner himself confuses the northern and southern fishes by recording two examples of *brevirostris* from Port Jackson.

In the Annals and Magazine of Natural History (4) xv. 1875, p. 147, Mr. O'Shaughnessy states that the *brevirostris* of Steindachner is identical with the *compressus* of Krefft, but for the reasons given above, as well as on account of the larger scales of the former, I cannot agree with him.

Instead of uniting the different forms in a single species of extraordinary variability, I prefer, at least for the present, to recognise four distinct but closely related species of Carp-Gudgeons, namely:—(1) *longi*, from the metropolitan district of New South Wales; (2) *compressus*, from the Clarence, Richmond, and Tweed River districts; (3) *brevirostris*, from the Mary River — Australian Museum† and ? Challenger—and Port Denison—Krefft—to Cape York,—Steindachner—and (4) *elevatus*, Macleay, from Port Darwin, North-western Australia.

I obtained nine examples of this handsome species from one of the waterholes on the estate of the Hon. Wm. Long on the 24th of April last, and have much pleasure in dedicating it to that gentleman in remembrance of the pleasant afternoon spent at Chipping Norton.

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* Sitzb. Ak. Wien, lvi. i. 1867, p. 314.

† Two small bleached specimens in very bad condition.

The difference in colour between the sexes is so marked that it was only when examining my specimens on the following day that I recognised the relationship; this is possibly more apparent during the spawning season than at other times.

The dark purplish ground colour which is so conspicuous a feature, in the males at least, of both *compressus* and *brevirostris* is entirely absent in *longi*, its place being taken by orange, and so brilliant is this colour that it was only with difficulty that I could persuade many persons that they were not Gold-fishes. Curiously enough, a small specimen, which had evidently suffered from an accident in its youth, had partially reproduced the variety of the Golden Carp known as the "Telescope fish," the eyes being produced in front of the head.

The specimens measured from 82 to 100 millimeters and were all full of spawn.

The types are in my possession.

Krefftius, gen.nov.

Eleotris, sp. auctt.

Body oblong, compressed posteriorly, the back broad and flat in front of the dorsal fins, rounded behind; head rather large, about as wide as deep, the snout moderate and but little depressed; mouth small and oblique, the lips fleshy; premaxillaries slightly protractile; maxillaries narrow, with the distal end exposed and bent forwards; lower jaw a little the longer. Jaws with a band of small hooked teeth, the outer series enlarged and fixed; lower pharyngeals forming together a subtriangular patch, armed with small acute fixed teeth, the anterior and symphyseal series more or less enlarged; nostrils widely separated, the anterior valvular; eyes lateral; none of the bones of the head armed; gill-openings extending forwards to below the angle of the preopercle, the isthmus a little wider than the interorbital region; five branchiostegals; pseudobranchiæ present, small; gill-rakers short, stout, and serrulate. Dorsal fins separate, with vii, i 8 rays, the spinous ones flexible; anal fin commencing behind the origin of the second dorsal, with i 8 rays; the last soft ray of the second

dorsal and anal fins divided to the base; ventral fins not in contact basally, inserted a little behind the root of the pectorals, with i 5 rays, the fourth produced and filiform; pectoral fins rounded, with 15 or 16 rays, the middle ones the longest; caudal fin rounded, the peduncle strong. Genital papilla large, triangular in the male, oblong in the female. Scales large and adherent, those of the tail not much larger than those of the trunk; head partially scaly, the snout naked; scales of the head and anterior portion of the body cycloid, the remainder ciliated. Vertabræ 28 (13+15).

Etymology.—Dedicated to the late Mr. Gerard Krefft, to whom belongs the honour of having first pointed out the differences between certain of the Eleotrids of New South Wales.

Type.—*Eleotris australis*, Krefft.

Distribution.—Coastal region of New South Wales.

Krefftius australis.

Eleotris australis, Krefft, Proc. Zool. Soc. London, 1864, p. 183; Castelnau, Proc. Linn. Soc. N.S. Wales, iii. 1878, p. 384 (1879); Macleay, Proc. Linn. Soc. N.S. Wales, v. 1880, p. 617 (1881); Ogilby, Catal. Fish. N.S. Wales, p. 36, 1886.

Striped Gudgeon.

D. vii, i 8. A. i 8. P. 15-16. Sc. 31-33/8-9.

Body stout and moderately deep, the tail compressed. Length of head $3\frac{2}{5}$ to $3\frac{3}{4}$, depth of body $3\frac{3}{4}$ to $4\frac{1}{2}$ in the total length; head as deep as or a little deeper than wide, its width $1\frac{1}{3}$ to $1\frac{2}{3}$, that of the slightly convex interorbital region 4 to $4\frac{3}{4}$, diameter of eye $4\frac{1}{5}$ to $4\frac{2}{3}$ in the length of the head; snout much broader than long, very obtusely rounded in front, not or but little depressed, from one-tenth to one-third of a diameter longer than the eye. Maxillary extending to or not quite to the vertical from the anterior margin of the eye, its length 3 to $3\frac{2}{5}$ in that of the head. Eight or nine gill-rakers on the lower branch of the anterior arch, the front ones reduced to spiny knobs. The space

between the origin of the first dorsal and the extremity of the snout is a little more than its distance from the base of the last soft ray; outer border of the first dorsal rounded, its height $1\frac{9}{10}$ to $2\frac{1}{10}$ in the length of the head, the last ray reaching when laid back in the ♂ to, in the ♀ not quite to the origin of the second dorsal; the rays of the soft dorsal increase in length in the ♂ to the last, which is $1\frac{3}{10}$ to $1\frac{2}{5}$ in the head, in the ♀ to the third or fourth—rarely the fifth—which are $1\frac{2}{3}$ to $1\frac{6}{7}$ in the head: the anal fin originates below the second ray of the soft dorsal, and the penultimate ray in the ♂, the third or fourth in the ♀ are the longest, as long as those of the soft dorsal: fourth ventral ray considerably longer than the third or fifth and terminating in a filament; in the ♂ it reaches well beyond the vent and is as long as the head, in the ♀ to or not quite to the vent and about one-fifth less than the head: pectoral fin rounded, the middle rays the longest, reaching to or not quite to the vertical from the dorsal interspace, its length $1\frac{1}{6}$ to $1\frac{1}{3}$ in that of the head: caudal fin rounded, $1\frac{1}{10}$ to $1\frac{1}{3}$ in the length of the head, its peduncle as long as or as much as one-fifth shorter than the head, the depth $1\frac{1}{2}$ to 2 in the length. Genital papilla large; lanceolate, simple, longer than the eye, and nearly twice as long as broad in the ♂; oblong, truncated, much shorter than the eye, and not much longer than broad in the ♀. Scales large, not larger on the tail than on the sides of the body; those of the head, nape, thorax, and abdomen smaller, and with very delicate concentric striæ; the remainder with coarser longitudinal striæ; scales of the interorbital region and cheeks smaller than those of the occiput and opercle.

Upper surface rich brown or purple, passing into green or greenish-gold on the sides, gray below, all the scales with a lighter border; each of the lateral scales has a large purple basal spot or short streak forming together longitudinal bands, those which originate behind the pectorals being the most conspicuous and persistent; between these bands are narrower stripes of bright gold; cheeks and opercles strongly tinged with yellow, the latter often clouded by more or less concurrent groups of microscopic violet dots; a purplish band from the lower angle of

the orbit to the base of the pectoral and sometimes a second parallel band to the axil; dorsal rays yellow, the spinous portion with two series of spots, the posterior of which are chestnut; the soft portion with four or five series of subequal chestnut spots or with a basal series of large and numerous small scattered spots; caudal fin violet, the rays with alternate transverse bars of white or yellow and chestnut spots; anal fin orange in the ♂, golden in the ♀ with a broad lilac or gray marginal band; ventral fins violet, with the outer borders white or golden; pectoral fins yellow bordered with gray and with a basal purple band which is succeeded by a conspicuous broad stripe of orange or gold, behind which a more or less distinct dusky band may be present; a large purple spot in the axil of the pectoral and another at the root of the caudal present or absent.

The description of the colouration given above is drawn up from a series of specimens taken during the breeding season, and represents, therefore, the nuptial dress of this fine species.

Irrespective of any difference in colour—which indeed is a mere matter of shade—an analysis of the above description shows that the male fish may at all times be distinguished from the female by the two following characters :—

(1) The shape and size of the genital papilla; and

(2) The greater comparative length of the fin rays, especially those of the posterior portion of the soft dorsal and the anal, and the fourth soft ray of the ventrals.

In addition to these, the caudal peduncle appears to be distinctly shorter and deeper in the adult male than in a female of the same size.

In the metropolitan district these Gudgeons deposit their spawn during the latter half of April and the beginning of May, and as soon as this important function has been completed they retire to their winter quarters and do not again make their appearance until the ensuing spring; during the intervening months they remain quiescent and cannot be taken either by hook or net, but I am unable to say precisely whether they merely conceal themselves under stones and snags or in holes in the bank or completely

bury themselves beneath the mud; I am, however, inclined to believe that the latter is the true solution of their disappearance; that their abstinence, whether enforced or voluntary, has no ill effects on them is proved by the perfect condition in which they are when they reappear with the first warm weather.

Krefft's Striped Gudgeon is abundant in all the fresh waters in the neighbourhood of Sydney, and extends its range northwards at least as far as the Clarence River, from whence specimens were obtained by its original describer; it appears to prefer muddy waterholes and sluggish creeks to clearer and swifter waters, and is, therefore, more distinctly a denizen of the lower lands in the vicinity of the coast than is the next species.

My examples were taken from waterholes near Liverpool, in which I found them abundant, as also they are in the George's River above the weir. I have also examined specimens from the neighbourhood of Port Stephens, from Rope's Creek, from Cook's River, and from Nowra, as well as Krefft's types from Bronte and the Botany Swamps.

The largest of these examples measured 135 millimeters, and the description is drawn up from an examination of thirty-five specimens ranging from that size down to 63 millimeters.

Mulgoa, gen.nov.

Eleotris, sp. auctt.

Body elongate-oblong, strongly compressed posteriorly, the back broad and almost flat in front of the dorsal fins, rounded behind; head moderate, about as deep as wide, the snout slightly depressed; mouth small and oblique, the lips fleshy; premaxillaries slightly protractile; maxillaries narrow, but little arched, with the distal extremity exposed; lower jaw the longer. Jaws with a band of small curved teeth, the outer series slightly enlarged and fixed; lower pharyngeals forming together a subtriangular patch, armed with small, acute, fixed teeth, the anterior and symphyseal series enlarged; nostrils widely separated, the anterior valvular; eyes supero-lateral; none of the bones of the head armed; gill-openings extending forwards to below the angle of the

preopercle, the isthmus twice as wide as the interorbital region; five branchiostegals; pseudobranchiæ present, small; gill-rakers short, stout, and serrulate. Dorsal fins separate, with vi, i 8-9 rays, the spinous ones flexible; anal fin commencing well behind the origin of the second dorsal, with i 8-9 rays; the last soft ray of the second dorsal and anal fins divided to the base; ventral fins not in contact basally, inserted below the root of the pectorals, with i 5 rays, the fourth the longest, but not produced into crinoid filaments; pectoral fins rounded, with 18 or 19 rays, the middle ones the longest; caudal fin rounded, the peduncle strong. Genital papilla large, triangular in the male, oblong in the female. Scales moderate and adherent, those of the occiput about as large as those of the tail and a little larger than those of the trunk; head partially scaly, the interorbital region, snout, and anterior portion of the cheeks naked; scales of the head, nape, and throat cycloid, all the rest ciliated and finely carinated; head with numerous series of small pores. Vertebræ 28 (12 + 16).

Etymology.—Named after the district in which the typical species was first obtained and where it is abundant.

Type.—*Eleotris coxii*, Krefft.

Distribution.—Coastal region of New South Wales.

Mulgoa coxii.

Eleotris coxii, Krefft, Proc. Zool. Soc. London, 1864, p. 183; Macleay, Proc. Linn. Soc. N.S. Wales, v. 1880, p. 618 (1881); Ogilby, Catal. Fish. N.S. Wales, p. 36, 1886.

Eleotris richardsonii, Steindachner, Sitzb. Ak. Wien, liii. i. 1866, p. 455, c. fig.; Ogilby, l.c.

Eleotris mastersii, Macleay, l.c. p. 622; Ogilby, l.c.

Cox's Gudgeon.

D. vi, i 8-9. A. i 8-9. P. 18-19. Sc. 37-40/11.

Body stout and moderately elongated, the tail compressed. Length of head $3\frac{2}{3}$ to $3\frac{9}{10}$, depth of body $4\frac{3}{5}$ to $5\frac{1}{2}$ in the total length; head as wide as or a little wider than deep, its width $1\frac{1}{2}$

to $1\frac{3}{4}$, that of the flat interorbital region $7\frac{1}{4}$ to $8\frac{1}{4}$, diameter of the eye 4 to $4\frac{3}{4}$ in the length of the head; snout much broader than long, rounded in front and slightly depressed, from one-tenth to two-fifths of a diameter longer than the eye. Maxillary not reaching to the vertical from the anterior margin of the eye, its length $3\frac{1}{5}$ to $3\frac{1}{2}$ in that of the head. Eight or nine gill-rakers on the lower branch of the anterior arch, the last ones reduced to serrulate knobs. The space between the origin of the first dorsal fin and the extremity of the snout is as long as or a little longer than its distance from the base of the last soft ray; outer border of the first dorsal fin rounded, the third or fourth ray the longest, $1\frac{5}{6}$ to $2\frac{1}{10}$ in the length of the head, and the last ray when laid back reaches in the ♂ to, in the ♀ not quite to the origin of the second dorsal; in the ♂ the fourth and fifth, in the ♀ the second and third rays of the second dorsal are the longest, $1\frac{2}{3}$ to $1\frac{3}{4}$ in the head: the anal fin originates below the third ray of the second dorsal; the sixth and seventh rays are the longest, as long as the soft dorsal rays: fourth ventral ray not reaching to the vent in either sex, its length $1\frac{1}{4}$ to $1\frac{1}{2}$ in the head: middle pectoral rays extending to the vertical from the origin of the second dorsal or not quite so far, their length in the ♂ subequal to, in the ♀ about one-fifth shorter than that of the head: caudal rounded, $1\frac{1}{10}$ to $1\frac{1}{5}$ in the length of the head; the peduncle stout, as long as or a little shorter than the head, its depth 2 to $2\frac{1}{5}$ in its length. Genital papilla triangular, as long or nearly as long as the eye, and much longer than wide in the ♂; quadrangular, two-thirds or less than two-thirds of the eye, and as long as or but little longer than wide in the ♀, in which the posterior border is concave. Scales of the opercle unequal in size, deeply embedded, and more or less non-imbricate; posterior portion of the cheeks with rather small, deeply embedded, non-imbricate scales; a series of small closely set pores from the snout round the upper margin of the eye, extending backwards between the occiput and opercles to the shoulder.

Purple to olive-green above, ultramarine-blue to silvery below, the sides sometimes tinged with yellow; the lighter-coloured

specimens are everywhere powdered with minute dusky dots; back with or without a series of dark blotches; a similar series of more or less irregularly arranged, often concurrent blotches almost always present along the middle of the sides and ending in a large dark blotch at the root of the caudal fin; side of head generally with two oblique dark bars, the upper from the postero-superior angle of the eye to the axil of the pectoral, forming a conspicuous spot on the upper half of the base; the lower from the snout along the inferior margin of the eye to the edge of the opercle, the interspace sometimes as dark as the bars; chin purple; a dusky blotch on the gill-rakers; dorsal fins, the first with a broad orange to pale yellow or hyaline dark-edged median band, the second with two or three similar but narrow bands near the base, the outer half clouded with purple or violet; caudal yellowish-brown, closely ornamented with a network of more or less regular dark spots; anal stone-gray or vinous, tipped with violet, often with the anterior ray brown and a median posterior golden patch; ventrals violet or gray, sometimes washed with gold towards the tip; pectorals olive-green, with or without a dusky shade on the upper rays and with a more or less brilliant golden basal band. Irides golden brown.

As a rule the more brilliant colours—the purple, blue, and orange—may be taken as the prerogative of the male fish, but this is not always the case, one or two females in my possession being quite as brightly marked as their partners.

All my specimens were obtained during the spring, and I cannot therefore say whether any difference in colouration takes place during the breeding season.

This species has been exceptionally unfortunate in its describers; Krefft—who obtained his examples from Dr. James C. Cox—described them as having seven rays in the anterior dorsal fin; his type specimen, which came from the Mulgoa Creek, a tributary of the Nepean River, into which it falls not far from Penrith, and two others from Rope's Creek in the same district, still bearing labels in Krefft's own handwriting, are fortunately in existence and possess six rays only in every instance; he also

describes the head as being scaly, which is misleading, as the greater part of the cheeks, the interorbital region, and the snout are naked.

Two years subsequently Dr. Franz Steindachner, in his description of *Eleotris richardsonii*, gives the number of rays in the first dorsal as seven in the letterpress, while in the excellent figure (unnamed and unnumbered) six are correctly shown; there is no other material difference between Steindachner's description and mine except in the comparative measurements of the interorbital region, the width of which according to him is greater than the diameter of the eye, while a reference to the above diagnosis will show that I make it much less at all ages; this, however, may possibly be explained by a difference in the system of measurement employed, the width in my descriptions always being that of the bony space only.

Finally Sir William Macleay, in diagnosing *Eleotris mastersii*, again falls into the same error, giving seven as the number of spinous dorsal rays; of the five examples labelled as above, now in the University Museum and undoubtedly the very ones from which Macleay took his description, not a single one has more than six rays. Rope's Creek, whence the types of *E. mastersii* were brought, is one of the original localities from which *E. coxii* came.

From the shape of the genital papilla, as given by the three authors referred to above, it is evident that their descriptions were taken in every case from female examples.

Cox's Gudgeon is very generally distributed throughout the entire network of streams and ponds connected with the Upper Hawkesbury, and wherever found appears to be abundant. Hitherto I have failed to find it east of the range which divides the Nepean and Wollondilly from the Parramatta and George's Rivers, and am, therefore, sceptical as to its occurrence in the Bronte Lagunes as asserted by Krefft; as far as my experience goes, this species is confined to the upper waters of the Hawkesbury, where it replaces *Krefftius australis*, which is the prevailing species along the littoral zone, the range of the two forms

overlapping in a kind of neutral zone which lies somewhere about the altitude of Penrith, where both species occur abundantly.

Besides the specimens enumerated above, I have to thank Mr. W. J. McCooey for three examples obtained in the neighbourhood of Camden; and more especially am I indebted to Mr. M. P. Gorman, of Burragorang, for three magnificent series forwarded during the months of October and November from the Wollondilly and "a small creek in the mountains away from the river altogether." These series are fully illustrative of the growth of the fish between the lengths of 33 and 138 millimeters, and the opportunity of examining them in a fresh condition has enabled me to thoroughly satisfy myself as to the identity of *richardsonii* with Krefft's species.

Fifty-three specimens have been examined in the preparation of this article, the largest measuring just 180 millimeters.

Ophiorrhinus, gen.nov.

Eleotris, *sp.* auctt.

Body rather elongate, compressed posteriorly, the back broad and flat in front of the dorsal fin, rounded behind; head very large and strongly depressed, much wider than deep, the snout short and very obtuse; mouth large and but little oblique, the lips thin, premaxillaries but little protractile; maxillaries narrow, with the distal end exposed and linear; lower jaw much the longer; jaws with a broad band of cardiform teeth, all of which are fixed; lower pharyngeals forming together a subtriangular patch, armed with small, stout, hooked teeth, a few at the apex and along the symphysis somewhat enlarged; nostrils moderately separated, the anterior valvular; eyes sublateral; none of the bones of the head armed; gill-openings extending forwards to below or before the angle of the mouth, the isthmus about half as wide as the interorbital space; six branchiostegals; pseudobranchiæ present, small; gill-rakers short and rather slender, mostly serrulate. Dorsal fins separate, with vii, i 9-10 rays, the spinous ones flexible; anal fin originating behind the second dorsal, with i 9-10 rays; the last soft rays of the second dorsal and anal fins divided

to the base; ventral fins small, not in contact basally, inserted beneath or somewhat in front of the base of the pectorals, with i 5 rays, the fourth soft ray the longest, but not produced or filiform; pectoral fins large and pointed, with 18 or 19 rays, the middle ones the longest; caudal fin rounded, the peduncle rather slender. Genital papilla small. Scales moderate and adherent, those of the tail much larger than those of the trunk; entire head, except a portion of the occiput, naked; scales deeply embedded, cycloid and smooth in front, imbricate and feebly ciliated behind; muciferous system of head well developed. Vertebræ 30 (13 + 17).

Etymology.—*ὄφις*, a snake; *ῥίν*, snout.

Type.—*Eleotris grandiceps*, Krefft.

Distribution.—Coastal region of south-eastern Australia.

The following analysis will suffice to distinguish the two species here described :—

Width of head $1\frac{2}{5}$-$1\frac{2}{3}$, of interorbital region $4\frac{2}{3}$-$5\frac{2}{5}$, length of fourth ventral ray $1\frac{3}{5}$-$1\frac{3}{4}$, of caudal peduncle $1\frac{2}{5}$-$1\frac{2}{3}$ in the length of the head; inner series of teeth enlarged; 11-12 gill-rakers; scales 42 or less along the middle of the body ... *grandiceps*, p. 746

Width of head $1\frac{2}{3}$-2, of interorbital region $5\frac{1}{2}$-$6\frac{1}{2}$, length of fourth ventral ray 2-$2\frac{2}{5}$, of caudal peduncle $1\frac{1}{5}$-$1\frac{1}{3}$ in the length of the head ; all the teeth subequal ; 7-9 gill-rakers; scales 43 or more along the middle of the body ... ... *nudiceps*, p. 748

Ophiorrhinus grandiceps.

Eleotris grandiceps, Krefft, Proc. Zool. Soc. London, 1864, p. 183; Macleay, Proc. Linn. Soc. N.S. Wales, v. 1880, p. 618 (1881); Ogilby, Catal. Fish. N.S. Wales, p. 36, 1886.

Flat-headed Gudgeon.

D. vii. i 9-10. A. i 9. P. 19. Sc. 38-42/12.

Body moderately elongate, tapering from the shoulder, the tail strongly compressed. Length of head $2\frac{9}{10}$ to $3\frac{1}{5}$, depth of

body 5 to 6 in the total length; depth of head $2\frac{1}{10}$ to $2\frac{1}{5}$ (♂), $2\frac{1}{4}$ to $2\frac{1}{2}$ (♀), width of head $1\frac{2}{5}$ to $1\frac{1}{2}$ (♂), $1\frac{2}{5}$ to $1\frac{2}{3}$ (♀), of inter-orbital region $4\frac{2}{3}$ to $4\frac{5}{6}$ (♂), 5 to $5\frac{2}{5}$ (♀), diameter of eye $4\frac{2}{3}$ to $5\frac{1}{5}$ in the length of the head; snout broad, rounded in front, and much depressed, one-half to three-fifths of a diameter longer than the eye. Maxillary extending to the vertical from the posterior margin of the eye (♂), the middle of the eye (♀), its length $1\frac{7}{10}$ to $1\frac{6}{7}$ (♂), 2 to $2\frac{1}{4}$ (♀) in that of the head. The teeth of the inner series are the largest, those preceding them growing gradually smaller. Eleven or twelve gill-rakers on the lower branch of the anterior arch. The space between the origin of the first dorsal fin and the extremity of the snout is greater than its distance from the base of the last soft ray; outer margin of the spinous dorsal convex, the second or third ray the longest, $2\frac{1}{3}$ to $2\frac{1}{2}$ in the length of the head, and reaching when laid back in the ♂ to, in the ♀ not so far as the origin of the second dorsal; in the ♂ the seventh and eight soft rays are the longest, $1\frac{1}{2}$ to $1\frac{3}{4}$, in the ♀ the third and fourth are the longest, $2\frac{1}{10}$ to $2\frac{1}{4}$ in the length of the head: the anal fin commences a little behind the origin of the second dorsal and is in all respects similar to it: fourth ventral ray not greatly produced beyond the third or fifth and not nearly reaching to the vent in either sex, its length $1\frac{2}{5}$ to $1\frac{3}{4}$ in that of the head: middle pectoral rays the longest; they are in the ♂ much longer than the fourth ventral ray, reaching well beyond the vertical from the origin of the second dorsal, and $1\frac{1}{4}$ to $1\frac{1}{3}$ in the length of the head, in the ♀ subequal to the fourth ventral ray, reach to or not quite to the vertical from the dorsal interspace, and $1\frac{1}{2}$ to $1\frac{2}{3}$ in the head: caudal rounded, $1\frac{2}{10}$ to $1\frac{1}{2}$ in the length of the head; the peduncle rather slender, not differing appreciably in both sexes, its length $1\frac{2}{5}$ to $1\frac{2}{3}$ in that of the head, its depth $2\frac{1}{3}$ to $2\frac{2}{3}$ in its length. Genital papilla very small and triangular in the ♂, oblong and notched in the ♀, in which it is somewhat larger. Scales small and irregular anteriorly; those on the tail with an angular border; occipital scales small, deeply embedded, and non-imbricate, extending forwards almost to the eyes.

Pale reddish-brown above, yellowish below, the head darker, everywhere densely punctulated with blackish dots which are often concurrent, forming two more or less conspicuous series of dark spots, one along the dorsal profile, the other along the middle of the body, the latter terminating in a blotch which is always present at the base of the caudal fin; a pair of oblique brown bands from the eye across the opercles generally present; first dorsal pale yellow with a basal, median, and marginal dusky band; the second similar but with four or five narrower bands; caudal with about eight irregular transverse bars, which often form a network; anal and ventrals gray, with or without microscopic dusky dots; pectorals yellow, with a more or less faint darker basal band.

In the breeding season the upper surfaces, dorsal and caudal fins are deeply tinged with salmon colour.

I found this to be the most abundant species in the waterholes near Liverpool on the occasion of the visit above referred to, when, like the two other species obtained at the same time, they were busily engaged in the duties of reproduction. Subsequently I obtained a number of young specimens, under two inches in length from a waterhole at Camden Park, but failed to catch any adults.

The Flat-headed Gudgeon is an inhabitant of the coastal watershed of New South Wales from the Richmond River—whence Krefft records it—southwards; it is abundant in the metropolitan district, and the limit of its range inland appears to be somewhat similar to that of *Krefftius australis* or extending to an altitude of about one hundred feet above the level of the sea; exactly how much further southward it ranges I am unable to say.

This species never attains to the size of the two preceding, the largest example, of twenty three utilised in the preparation of the above description, barely measuring 100 millimeters.

Ophiorrhinus nudiceps.

Eleotris nudiceps, Castelnau, Proc. Zool. & Acclim. Soc. Vict. i. 1872, p. 126 (1873); Macleay, Proc. Linn. Soc. N.S. Wales,

v. 1880, p. 619 (1881); Lucas, Proc. Roy. Soc. Vict. (2) ii. 1890, p. 29.

? *Philypnodon nudiceps*, Bleeker.

Yarra Gudgeon.

D. vii, i 9-10. A. i 9. P. 19. Sc. 43-47/12-13.

Body moderately elongate, tapering from the shoulder, the tail strongly compressed. Length of head 3 to $3\frac{1}{4}$, depth of body $5\frac{2}{5}$ to $5\frac{3}{5}$ in the total length; depth of head 2 to $2\frac{1}{2}$, width of head $1\frac{3}{5}$ to 2, of interorbital region $5\frac{1}{2}$ to $6\frac{1}{3}$, diameter of eye $4\frac{1}{2}$ to $4\frac{9}{10}$ in the length of the head; snout broad, rounded in front, and moderately depressed, one-third to one-half of a diameter longer than the eye. Maxillary extending to the vertical from the anterior third to the posterior fourth of the eye, its length $1\frac{9}{10}$ to $2\frac{1}{2}$ in that of the head. All the teeth are subequal in size. Seven to nine gill-rakers on the lower branch of the anterior arch. The space between the origin of the first dorsal and the extremity of the snout is greater than its distance from the base of the last soft ray; outer margin of the spinous dorsal gently rounded, the second, third, or fourth ray the longest, $2\frac{2}{5}$ to $2\frac{3}{4}$ in the length of the head, and reaching when laid back nearly to, to, or a little beyond the origin of the second dorsal; the seventh or eighth soft rays are the longest, $1\frac{9}{10}$ to $2\frac{1}{3}$ in the length of the head: the anal fin commences behind the origin of the second dorsal and is in all respects similar to it: fourth ventral ray but little produced beyond the third and fifth, not nearly extending to the vent in either sex, its length $2\frac{1}{10}$ to $2\frac{2}{5}$ in that of the head: middle pectoral rays the longest, reaching nearly to, to, or a little beyond the vertical from the origin of the second dorsal, and are $1\frac{3}{10}$ to $1\frac{2}{5}$ in the length of the head: caudal rounded, $1\frac{1}{2}$ to $1\frac{3}{5}$ in the length of the head; the peduncle rather slender, its length $1\frac{1}{5}$ to $1\frac{1}{3}$ in that of the head, its depth $2\frac{3}{10}$ to $2\frac{2}{5}$ in its length. Genital papilla triangular in the ♂, oblong and crenulate in the ♀. Scales small and very irregular anteriorly, some of those on the tail with an angular border; occipital scales deeply embedded and non-imbricate, extending forwards beyond the preopercle.

Olive-green or brown above, the sides paler, gray below: head purple above, shading into violet beneath; sides with a series of faint dusky blotches, only that in front of and partly on the base of the caudal fin at all conspicuous; first dorsal fin violet with three longitudinal series of purplish or chestnut spots; the second pale grayish-green with four series of similar but smaller spots; caudal, anal, and ventral fins gray, sometimes with the extremities of the rays violet; pectorals grayish-green, the upper half the darker.

This is the only Eleotrid which has as yet come under my notice from Victoria, nor so far as I know have any of my Melbourne co-workers been more fortunate, though two other species have been recorded from the Yarra by European scientists; namely, *cyprinoides* by Klunzinger and *melbournensis* by Sauvage.*

This Gudgeon is very abundant in the Yarra, and there cannot be any doubt as to the identity of my species with that of Count Castelnau; there are, however, several points of difference which need explanation, as follows:—

(1) In Castelnau's description the interorbital region is said to be "one-third" of the length of the head, while I find it to be only half that width;† this may be explained in a similar manner to that suggested as the cause of difference between Steindachner's description of *Eleotris richardsonii* and mine of *Mulgoa coxii* (see p. 744).

(2) The apparently larger size of the eye in my examples is easily capable of explanation by the fact that Castelnau's measurement of the length of the head is taken from the extremity of the projecting mandible, mine from that of the snout.

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* It is one of the most remarkable problems connected with Australian fish literature how the continental naturalists, receiving small collections from such well worked localities as Port Jackson and Hobson's Bay, invariably succeed in obtaining fishes, which we, despite our local knowledge, and despite that having been once recorded they are more carefully sought for, are unable to find.

† Castelnau's words—"eyes considerably apart, the distance from one or other being nearly equal to the third of the length of the head"—are rather ambiguous, but there can be little doubt as to what his meaning is.

(3) According to Castelnau, "the head has no scales," but those of the occiput must have been overlooked by him, for though they are small and deeply embedded, they are nevertheless plainly visible.

These, however, are but minor discrepancies as compared with (4) the dentition; referring to this Castelnau writes—"the teeth . . . extend on the vomer and the palatines; the posterior part of the tongue is also covered with them." This is quite the opposite of what I find; in all my examples there is no sign of teeth on any part of the mouth except those on the jaws. If Castelnau's fish really had the subsidiary teeth attributed to it by its describer—which on a review of all the facts of the case I may be permitted to doubt—it would of course be necessary to place it in another genus; and this has possibly been already done by Dr. Bleeker, since his *Philypnodon nudiceps* possesses the same dentition as that assigned to his species by Castelnau.*

The differences which separate *grandiceps* from *nudiceps* are undoubtedly slight, but those which are noticed in the preceding analysis (*see p.* 746) appear to be constant; the close affinity between the two species was recognised by Castelnau, who writes: "The principal reason for not uniting my sort with Krefft's is, that he says that the pectorals attain the base of the anal; while in my specimens they do not." I consider this elongation of the pectoral fins to be merely a sexual character.

This little fish is abundant in the Yarra, along the banks of which it is known as the "Big-head" according to Castelnau

* The want of Bleeker's paper prevents me from ascertaining whether his genus *Philypnodon* is founded upon Castelnau's description of *nudiceps*; if this be the case, Bleeker's genus, being specially formed on account of a character which it does not possess, must if monotypic be suppressed. And this raises another question to which I am unable to find a satisfactory answer, namely—if a genus be founded on a character which is purely mythical, should the name so proposed stand in preference to another correctly characterised from the same species but at a later date? If the practice of forming new genera from descriptions only were discouraged or disallowed, errors of this nature would soon cease.

(fide Lucas), who states that they are very voracious and feed on "fishes as large as themselves and generally of their own species."

Writing of this fish, Mr. T. S. Hall remarks (*in lit.*):—"It differs from Castelnau's *E. nudiceps* in the proportions of the head and especially in the teeth. Locality, "Yarra River at Melbourne (tidal)." Further on he says, "As a boy I have often caught what I imagine to be the same fish in the Barwon near Geelong in fresh water, and have seen a similar looking fish in the crater lake of Bullenmerrie, which is slightly brackish. I cannot vouch for the identity of the three forms. We used to call them 'bullies' or 'bull-heads,' and regarded them as poisonous." It is hardly necessary to say that the last supposition was erroneous.

My description is founded on an examination of sixteen specimens, ranging in size from 42 to 110 millimeters, for which I have to thank Mr. J. Kershaw, of the National Museum, and Mr. T. S Hall, of the Melbourne University, the latter of whom sent me no less than fourteen fine examples.

The type of *nudiceps* is not, so far as I know, in existence.

In Macleay's Catalogue twenty-nine species of *Eleotris* are included among Australian fishes, but as, since the publication of the Supplement in 1884, this number has been nearly doubled from various sources, I append a list of all the species which have been recorded as occurring within our limits or on the opposite coast of New Guinea up to the present day. As all or almost all these have been described as *Eleotris*, I have drawn up the list in alphabetical order, making no attempt at this stage to segregate the species in natural groups, and even including such synonyms as *mastersii* and the like, so that the present list may partake of the character of an index to the Australian forms.

1. *adspersa*, Castelnau, Proc. Linn. Soc. N.S. Wales, iii. 1878, p. 142.
2. *aporocephalus*, Macleay, Proc. Linn. Soc. N.S. Wales, ix. 1884, p. 33, = *planiceps* (not Castelnau) Macleay, l.c. viii. 1883, p. 206, ? = *porocephalus*, Cuvier & Valenciennes, xii. p. 237, 1837.

3. *australis*, Krefft, Proc. Zool. Soc. London, 1864, p. 183; see p. 737 et seq.
4. *brevirostris*, Steindachner, Sitzb. Ak. Wien, lvi. i. 1867, p. 314.
5. *butis*, Hamilton-Buchanan, Fish. Ganges, pp. 57, 367, 1822.
6. *castelnaui*, Macleay, Proc. Linn. Soc. N.S. Wales, v. 1880, p. 620 (1881), = *obscura* (not Schlegel) Castelnau, Proc. Zool. & Acclim. Soc. Vict. ii. 1873, p. 134 (1874).
7. *compressus*, Krefft, Proc. Zool. Soc. London, 1864, p. 184; see p. 735.
8. *concolor*, De Vis, Proc. Linn. Soc. N.S. Wales, ix. 1884, p. 692.
9. *coxii*, Krefft, Proc. Zool. Soc. London, 1864, p. 183; see p. 741 et seq.
10. *cyanostigma*, Bleeker, Kokos, iv. p. 452.
11. *cyprinoides*, Cuvier & Valenciennes, Hist. Nat. Poiss. xii. p. 248, 1837.
12. *darwiniensis*, Macleay, Proc. Linn. Soc. N.S. Wales, ii. 1877, p. 360 (1878) as *Agonostoma darwiniense*.
13. *devisi* nom. nov., = *cavifrons* (not Blyth) De Vis, Proc. Linn. Soc. N.S. Wales, ix. 1884, p. 693.
14. *elevata*, Macleay, Proc. Linn. Soc. N.S. Wales, v. 1880, p. 622 (1881) = *compressus* (not Krefft) Macleay, l.c. ii. 1877, p. 358 (1878); see p. 735.
15. *elongata*, Alleyne & Macleay, Proc. Linn. Soc. N.S. Wales, i. 1876, p. 334 (1877).
16. *fusca*, Bloch & Schneider, Syst. Ichth. p. 453, 1801.
17. *gobioides*, Cuvier & Valenciennes, Hist. Nat. Poiss. xii. p. 247, 1837.
18. *grandiceps*, Krefft, Proc. Zool. Soc. London, 1864, p. 183; see p. 746 et seq.
19. *gymnocephalus*, Steindachner, Sitzb. Ak. Wien, liii. i. 1866, p. 453 (1867); ? *Gymnobutis gymnocephalus*, Bleeker.
20. *gyrinoides*, Bleeker, Sumatra, ii. p. 272, 1853.

21. *humilis*, De Vis, Proc. Linn. Soc. N.S. Wales, ix. 1884, p. 690.
22. *immaculata*, Macleay, Proc. Linn. Soc. N.S. Wales, viii. 1883, p. 263.
23. *larapintæ*, Zietz, Rep. Horn Exped. Centr. Austr. Zool. p. 179, 1896.
24. *laticeps*, De Vis. Proc. Linn. Soc. N.S. Wales, ix. 1884, p. 692.
25. *lineolatus*, Steindachner, Sitzb. Ak. Wien, lv. i. 1867, p. 13.
26. *longi*, Ogilby, Proc. Linn. Soc. N.S. Wales, xxi. 1896, p. 733 et seq.
27. *longicauda*, De Vis, Proc. Linn. Soc. N.S. Wales, ix. 1884, p. 691.
28. *macrodon*, Bleeker, Bengal en Hind. p. 104, 1853.
29. *macrolepidotus*, Bloch, Ausl. Fisch. v. (pt. ix.) p. 35, 1797, not Günther, Fisch. Südsee, Heft vi. p. 186, which is *tumifrons*; = *aporos*, Macleay.
30. *mastersii*, Macleay, Proc. Linn. Soc, N.S. Wales, v. 1880, p. 622 (1881), = *coxii*; see p. 744.
31. *melbournensis*, Sauvage, Bull. Soc. Philom. (7) iv. 1880, p. 57.
32. *mimus*, De Vis, Proc. Linn. Soc. N.S. Wales, ix. 1884, p. 690; ? = *adspersus*.
33. *modesta*, Castelnau, Proc. Zool. & Acclim. Soc. Vict. ii. 1873, p. 85 (1874).
34. *mogurnda*, Richardson, Voy. Erebus & Terror, Ichth. p. 4, 1846.
35. *muralis*, Cuvier & Valenciennes, Hist. Nat. Poiss xii. p. 253, 1837.*
36. *nigrifilis*, nom. nov., = *lineata* (not *Dormitator lineatus*, Gill, 1863) Castelnau, Res. Fish. Austr. p. 24, 1875.

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* There is also an *Electris muralis*, Sauvage, Bull. Soc. Philom. (7) vi. 1882, p. 172; as I have not had an opportunity of consulting this work I cannot say whether he is referring to the above species or describing a new one by the same name.

37. *nudiceps*, Castelnau, Proc. Zool. & Acclim. Soc. Vict. i. 1872, p. 126 (1873); see p. 748 et seq.

38. *oxycephala*, Schlegel, Faun. Japon. Poiss. p. 150, 1850.

39. *pallida*, Castelnau, Res. Fish. Austr. p. 24, 1875.

40. *planiceps*, Castelnau, Proc. Linn. Soc. N.S. Wales, iii. 1878, p. 49.

41. *porocephaloides*, Bleeker, Sumatra, iii. p. 514; ? = *porocephalus*.

42. *porocephalus*, Cuvier & Valenciennes, Hist. Nat. Poiss. xii. p. 237, 1837.

43. *reticulatus*, Klunzinger, Sitzb. Ak. Wien, lxxx. i. 1879, p. 385 (1880).

44. *richardsonii*, Steindachner, Sitzb. Ak. Wien, liii. i. 1866, p. 455, = *coxii*, see p. 744.

45. *robustus*, De Vis, Proc. Linn. Soc. N.S. Wales, ix. 1884, p. 692.

46. *selheimi*, Macleay, Proc. Linn. Soc. N.S. Wales, ix. 1884, p. 33, = *planiceps* (not Castelnau) Macleay, o.c. vii. 1882 p. 69.

47. *simplex*, Castelnau, Proc. Linn. Soc. N.S. Wales, iii. 1878, p. 49.

48. *striatus*, Steindachner, Sitzb. Ak. Wien, liii. i. 1866, p. 452.

49. *sulcaticollis*, Castelnau, Proc. Linn. Soc. N.S. Wales, iii. 1878, p. 142.

50. *tæniura*, Macleay, Proc. Linn. Soc. N.S. Wales, v. 1880, p. 624 (1881).

51. *tumifrons*, Cuvier & Valenciennes, Hist. Nat. Poiss. xii. p. 241, 1837, = *ophiocephalus*, Macleay.

Three of the species included in the above list have so far been found on the opposite coast of New Guinea, but may confidently be expected to occur on our northern shores; they are *butis*, *gyrinoides*, and *immaculatus*.

Of the remaining forty-seven only six—*australis*, *coxii*, *grandiceps*, *compressus*, *oxycephalus* and *mastersii*—were known to

Macleay as inhabitants of the rivers and estuaries of New South Wales up to 1884, when his "Supplement" was published, but two years later I was able to increase this number by four, adding *mogurnda*, *gymnocephalus*, *striatus*, and *richardsonii;* two of these, however,—*mastersii* and *richardsonii*—I have shown in the foregoing paper to be identical with *coxii;* a third—*mogurnda*—rests its claim upon its inclusion by Steindachner in his "Fishes of Port Jackson (*Sitzb. Ak. Wien, lvi. i. 1867, p. 328*) and the authority of a single specimen now in the Australian Museum, and said to have come from the Clarence River, and though this is very possibly correct, still in the lack of confirmatory evidence it is safest to look with suspicion on any record of its occurrence so far south; a fourth species—*oxycephalus*—I unhesitatingly reject: this is one of the fishes said to have been obtained by the collectors of the Novara during the short stay of that war-ship in the waters of Port Jackson, but which has never been found since; it is a Chinese and Japanese species, and the improbability of its occurrence so far from its native shores is obvious.* With the addition of the new species above described and of *gobioides*, included by Steindachner in his Port Jackson fishes,† this leaves

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* The following species, only recorded in the Fishes of the Novara, I must excise from the New South Wales catalogue until more conclusive evidence of their occurrence is available:—1, *Mesoprion marginatus;* 2, *Apogon quadrifasciatus;* 3, *Chætodon setifer;* 4, *Lethrinus harak;* 5, *Amphacanthus hexagonatus;* 6, *Batrachus trispinosus;* 7, *Gobius frenatus;* 8, *Eleotris oxycephalus;* 9, *Petroscirtes solorensis;* 10, *Mugil cephalotus;* 11, *Crepidogaster tasmaniensis;* 12, *Ophiocephalus striatus;* 13, *Polyacanthus cupanus;* 14, *Platyglossus trimaculatus;* 15, *Pseudoscarus octodon;* 16, *Rhombosolea leporina;* 17, *Solea humilis;* 18, *Exocœtus unicolor;* 19, *Balistes maculatus;* 20, *Tetrodon richei;* and 21, *Tetrodon erythrotænia.* I do not, of course, assert that none of these fishes are found on the New South Wales coast, some of them—such as 7, 11, 12, 17, and 21—most probably are, but I distinctly reject them so long as their claim to admission rests solely on the unsatisfactory evidence adduced.

† This is a New Zealand species, and its occurrence here requires confirmation.

the New South Wales list with seven good and two doubtful species, namely:—

1. Carassiops compressus.
2. Carassiops longi.
3. Krefftius australis.
4. Mulgoa coxii.
5. Ophiorrhinus grandiceps.
6. Gymnobutis gymnocephalus.
7. ? striatus.

?8. Mogurnda mogurnda.

?9. Gobiomorphus gobioides.

I have been for some time past making special endeavours to obtain examples of *gymnocephalus* and *striatus*, but have failed so far in doing so, nor is either species represented in the collections of the Australian Museum or the Sydney University.

The genus *Gymnobutis* was probably founded by Bleeker with Steindachner's *gymnocephalus* as the type; I am unable to suggest to which of the recent genera *striatus* should be referred.